WEC-Sim Technical Training Course

PRESENTED BY

WEC-Sim Development Team

Advanced Features – Non-hydrodynamic Bodies

PRESENTED BY

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Overview of the non-hydrodynamic body implementation

- A non-hydrodynamic body has fundamentally different forces applied to it than other WEC-Sim bodies.

- Non-hydrodynamic (non-hydro) bodies can represent:
  - Fully submerged bodies below the wave's influence and without significant motion
  - Fully emerged bodies with no wetted surface

- Examples
  - OSWEC tutorial – demonstrates a fixed, hydrodynamic body
  - OSWEC Non-hydro Application – demonstrates a fixed, non-hydro body

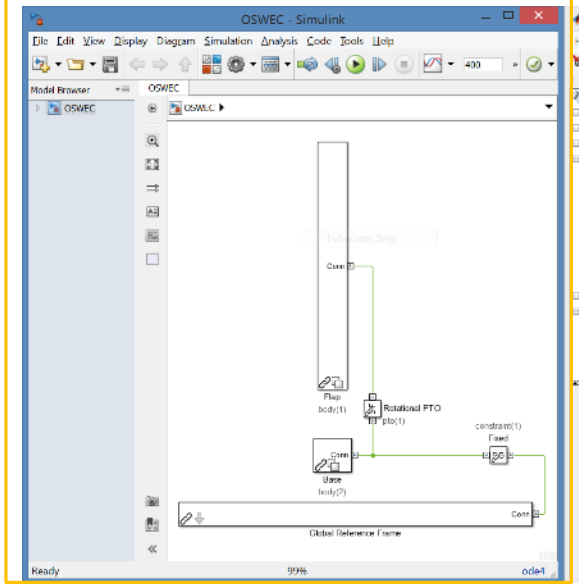
Hydrodynamic Body Example

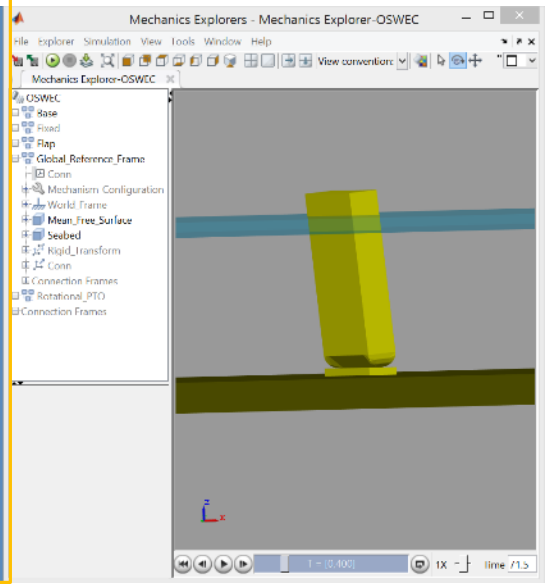
- **OSWEC Tutorial**
  - https://github.com/WEC-Sim/WEC-Sim/tree/master/tutorials/OSWEC
  - Models base, *body(2)*, as a fixed hydrodynamic body
  - Determines hydro forces on base, i.e. wave excitation force
  - Radiation and restoring forces are applied, but are zero since the body is fixed

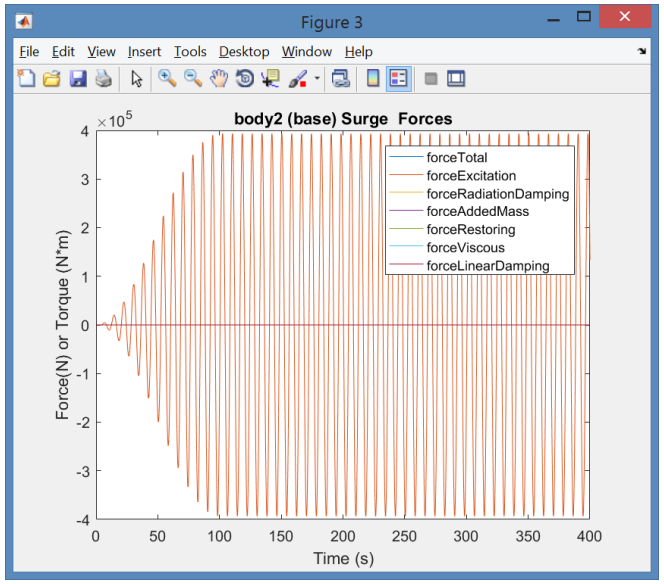
```
% Base
body(2) = bodyClass('hydroData/oswec.h5');      % Initialize bodyClass for Base
body(2).geometryFile = 'geometry/base.stl';     % Geometry File
body(2).mass = 999;                             % Creates Fixed Body
```

Excerpt from *wecSimInputFile.m*

Simulink Model





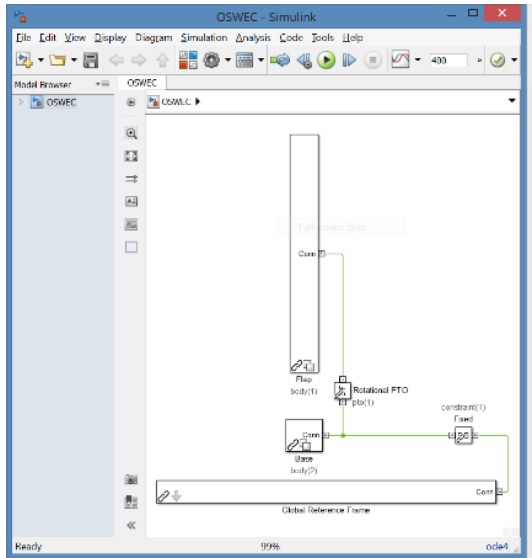


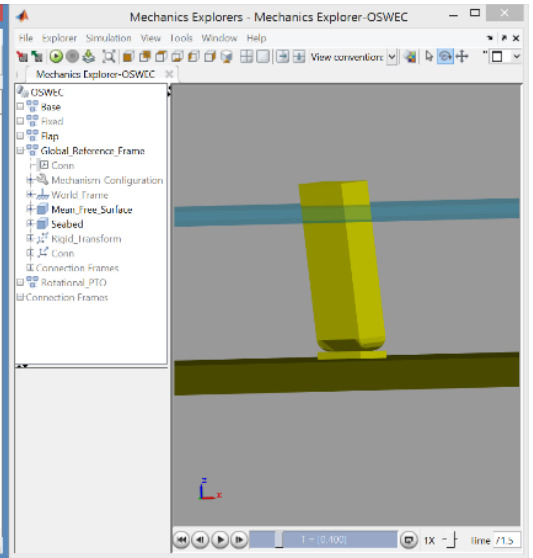
Non-Hydrodynamic Body Example

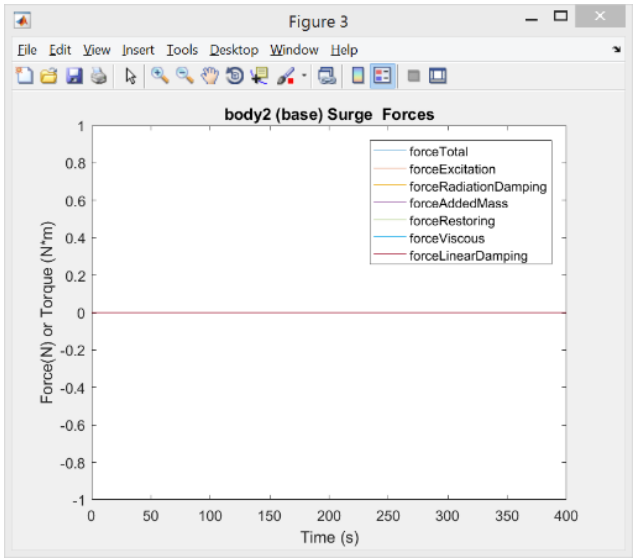
- **Nonhydro_Body Application**
  - https://github.com/WEC-Sim/WEC-Sim_Applications/tree/master/Nonhydro_Body
  - Models base, *body(2)*, as a fixed, non-hydrodynamic body
  - No hydro forces applied to the base, i.e. excitation, radiation, hydrostatic stiffness, …
  - Simplifies model and reduces required BEM solutions
  - NOTE: Non-hydro bodies do *not* have to be fixed

```
% Base (Non-hydro Body)
body(2) = bodyClass('');                    % Initialize bodyClass without an *.h5 file
body(2).geometryFile = 'geometry/base.stl'; % Geometry File
body(2).nonHydro = 1;                       % Turn non-hydro body on
body(2).name = 'base';                      % Specify body name
body(2).mass = 999;                         % Specify Mass
```

Excerpt from *wecSimInputFile.m*







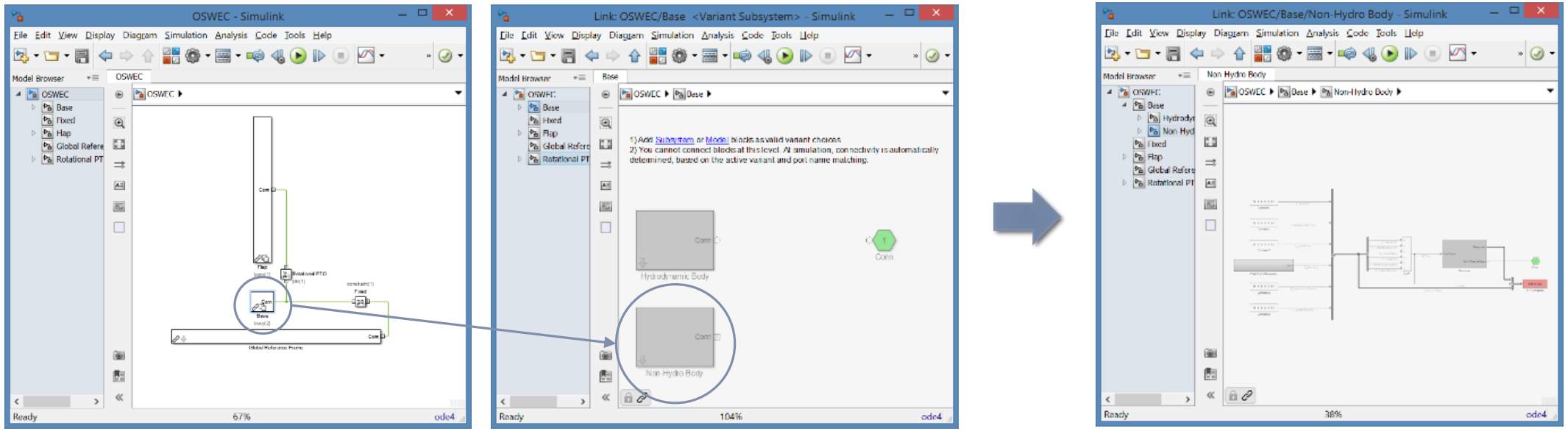
Non-Hydrodynamic Body Example

- **Nonhydro_Body Application**
  - https://github.com/WEC-Sim/WEC-Sim_Applications/tree/master/Nonhydro_Body
  - Input File
    - Initialize body class (without *.h5) and name body
    - Set *body(2).nonHydro = 1;*
    - Define mass, inertia, center of gravity, displaced volume, etc
    - Define *.STL for visualization

```
% Base (Non-hydro Body)
body(2) = bodyClass('');                        % Initialize bodyClass without an *.h5 file
body(2).geometryFile = 'geometry/base.stl';     % Geometry File
body(2).nonHydro = 1;                           % Turn non-hydro body on
body(2).name = 'base';                          % Specify body name
body(2).mass = 999;                             % Specify Mass
body(2).inertia = [1 1 1];                      % Specify MOI
body(2).centerGravity = [0 0 -10.9];            % Specify Cg
body(2).centerBuoyancy = [0 0 0];               % Specify Cb
body(2).volume = 0;                             % Specify Displaced Volume
```

Non-Hydrodynamic Body Example

- **Nonhydro_Body Application**
  - https://github.com/WEC-Sim/WEC-Sim_Applications/tree/master/Nonhydro_Body
  - Simulink Model
    - *body(2).nonHydro = 1;*
    - Turns on *Non-Hydro Body* variant subsystem
    - Only applies gravity and buoyancy forces to base



Thank you!

All previous webinar materials and recordings are available online:

http://wec-sim.github.io/WEC-Sim/webinars.html

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